SubMM Wave Superconducting Hot-Electron Direct Detectors

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We are developing a new type of hot-electron direct detector (HEDD) which employs a weak electron-phonon coupling in superconducting microbridges. Such a detector with a potential NEP of 10^{-20} W/Hz^0.5 will meet the needs for future background-limited arrays on space telescopes. The HEDD is based on a 1-micron-size transition edge sensor fabricated from an ultra-thin film of a superconductor with T_c = 0.1-0.3 K. The strong temperature dependence of the electron-phonon coupling in impure superconductors allows for adjustment of the electron-phonon scattering time to the desirable value of ~ 1 ms. Thus, the HEDD eliminates the need in a micromachined, high-thermal-resistance suspension. The radiation frequency response of prototype antenna-coupled Nb devices has been found to be flat over the range 250-1000 GHz. Our current effort is aimed at the demonstration of operation of a planar antenna-coupled Ti HEDD at 300-600 GHz.